

Rollup Doors Retrofitted With Air Doors



Walnut Creek, Calif. — When federal and international sanitary inspections mandated flying insect infiltration reductions at a California pharmaceutical manufacturing plant's four shipping doors, project engineers started thinking far outside the box to save the facility more than \$75,000 in necessary door retrofit costs.

The inspectors' retrofit suggestions included replacing the 200,000-square-foot complex's ineffective and difficult to clean doorway strip curtains with air curtains, which are used in a variety of door applications to eliminate insect infiltration from industrial complex doorways to restaurant drive through windows.

Eliminating flying insects complies with Good Manufacturing Practices (GMP), a food and pharmaceutical manufacturing criteria applied to both incoming raw products and outgoing finished manufactured goods.

Initially there were many design obstacles; however the estimated \$75,000 cost of modifying the four doorways' roll up door mechanisms appeared to be an almost insurmountable challenge, according to Tyson Crowell, P.E., project director and bio-pharmaceutical technology leader, Yonkers Industries, Cary, N.C., a key construction partner for international biotech and pharmaceutical manufacturers that the building owner hired to solve the challenge.

Rollup doors are rarely combined with air curtains in retrofits because they both compete for the same strategic space directly above the door opening. Air curtain efficacy is greatest when mounted directly above the interior side of the doorway to discharge air down across the opening and meeting the floor slightly outside the threshold. The best alternative was raising and lengthening the rollup door mechanisms 28 inches to accommodate the 15 (h) x 18 (w)-inch air curtains on the 10-foot-high door openings at a cost of \$75,000 in labor and materials in addition to the air curtains cost.

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Additional costs also would be incurred from lost production and door use downtime. Any rollup door modification would require sealing the open door while modifying or relocating the rollup mechanism, a process that would take days and postpone the doorway's services. "The cost was important, but more critical was the fact we couldn't afford any downtime whatsoever, for the rollup doors," said Crowell, who is a project director for Yonkers' West Coast Operations, Walnut Creek, Calif.

Instead, Crowell and Van Sintchak, vice president of operations and energy recovery consultant at SSMarketing, Carson City, Nev., working with Crowell conceived the novel solution of allowing the rollup doors to remain untouched and usable while installing air curtains.

The duo designed angle iron supports to mount air curtains by Berner International, New Castle, Pa., two feet outward from the roll-up door. The air curtains are rotated 90-degrees with the air discharge facing the top of the doorway. To redirect the air discharge toward the floor, an aluminum air discharge plenum nozzle extension stretches 18-inches toward the wall, under the roll-up door mechanism and angles 90-degrees downward at the top of the door opening.

Six VSA model air curtains were outfitted with the plenum design to protect the one 11-foot-wide; one 13-foot-wide; and two 20-foot-wide door openings, the latter which required two 11-foot-wide air curtains each.

Dave Johnson, Berner International's director of engineering and a source Crowell had used on dozens of other industrial air curtain projects, custom-designed, built and tested the plenum idea. The 16-ga. (0.050) aluminum plenum has a 3-1/2-inch wide opening and stretches across the width of each air curtain. Also, an internal turning vane was installed at the 90-degree turn to eliminate the potential of turbulence and to help the adjustable discharge vanes that are used to direct the air stream. Air curtains were specified that offset a small additional static pressure created by the plenum nozzle extension. Johnson then used hot wire anemometer lab testing to assure the air curtain velocities and uniformity were sufficient to protect the door openings.

Once mounted, no adjustments were needed, because the volume, velocity and uniformity of the air discharge performed exactly to specifications, according to post-installation site tests performed by Sintchak.

Crowell had three alternatives to choose from besides the final solution. The air curtains could have been mounted on the doorways' exterior. However air curtains perform more effectively from an interior position and blowing slightly outside the doorway's threshold versus the opposite pattern of an exterior mounted unit. Air curtains can also be mounted vertically on the side of a doorway, however that positioning is vulnerable to fork lift damage. The third alternative of remounting the rollup door mechanism to allow space for air curtains above the doorway, would have been more expensive, but no more effective than the final plenum nozzle extension solution.

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Besides \$75,000 savings, there was no downtime for the doors and the plenum modifications raised the air curtain costs only by a nominal 10-percent. Although no data has been collected, insect infiltration is minimal and well within GMP standards, according to Crowell.

“The fact that this might be the first time an air curtain has been retrofitted on a roll-up doorway while keeping the roll-up door in place and in operation, might open a whole new approach to roll-up doors and energy conservation/insect control in industrial and warehouse situations,” said Sintchak.

Sintchak, who recently won Berner International’s inaugural “Innovation Award” for the project, concluded: “This project’s success is really attributed to engineers thinking outside the box...as a matter of fact, two feet outside the air curtain box.”

For more information, please visit www.berner.com [1].

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